Patent claims

1. A method for improved purification of a first substance, which is bound to paramagnetic microparticles (18), the microparticles (18) being suspended in a first liquid (20), with the following steps:

a) the microparticles (18) are exposed in a first container (10) to a first magnetic field, to thereby arrest them and prevent them from being washed away with a stream of the first liquid (20) and

b) after step a, at least part of the first liquid (20) is passed in a first direction through a first line (14), through a portion (16) of the first line (14), and exposed in the portion (16) to a second magnetic field or the first magnetic field, to thereby arrest microparticles (18) that have nevertheless been washed away, the cross-sectional area of the first line (14) being enlarged in the portion (16),

the second or first magnetic field within the portion (16) having a greater average field strength than the first magnetic field within the first container (10).

2. The method as claimed in claim 1, after step b, a second (40) and/or further liquid being passed in a second direction into the portion (16), and in a direction opposite to the first direction through the first line (14), an effect of the first and optionally present second magnetic field on the microparticles (18) being discontinued, so that the microparticles (18) arrested in the portion (16)

are suspended and at least partially washed back to the microparticles (18) arrested in step a.

3. The method as claimed in claim 2, the second direction being opposite to the first direction.

4. The method as claimed in one of the preceding claims, the second liquid (40) being chosen such that the first substance in it remains bound to the microparticles (18) and further substances or other contaminants are detached from the microparticles (18) or the first substance.

5. The method as claimed in one of the preceding claims, the further liquid being chosen such that the first substance in it is detached from the microparticles (18).

6. The method as claimed in one of the preceding claims, the portion (16) being formed in such a way that, when the second (40) and/or further liquid flows in the second direction, turbulences are produced in the portion, so that microparticles (18) deposited there are suspended.

7. The method as claimed in one of the preceding claims, a second line (34) in the portion (16) having an opening via which the second (40) and/or further liquid is passed into the portion (16) in such a way that turbulences are produced in the portion (16) and microparticles (18) deposited there are suspended.

8. The method as claimed in one of the preceding claims, the steps a and b being repeated with the second (40) and/or further liquid instead of the first liquid (20).

9. The method as claimed in one of the preceding claims, the first magnetic field acting in a region within the first container (10) and the microparticles (18) being exposed to the first magnetic field by a permanent magnet (38) being brought up to the region and the portion (16).

10. The method as claimed in one of claims 1 to 8, the first magnetic field acting in a region within the first container (10) and the microparticles (18) being exposed to the first and second magnetic fields by a permanent magnet (38) being respectively brought up to the region and the portion (16).

11. The method as claimed in one of the preceding claims, the microparticles (18) having an average diameter of from 50 nm to 50 µm, preferably from 500 nm to 50 µm.

12. The method as claimed in one of the preceding claims, the microparticles (18) having a coating of glass, silicate, silane, an ion exchanger, a receptor, a ligand, an antigen, an antibody or a nucleic acid.

13. A device for carrying out a method as claimed in one of claims 1 to 12, comprising:

- a first container (10) for providing or receiving a first liquid (20) and paramagnetic microparticles (18),

- a first line (14), opening out into the first container (10), and

- a portion (16) of the first line (14), which has an enlarged cross-sectional area in comparison

with the remaining cross-sectional area of the first line (14),

- a first magnet (38) or a first recess (36) for receiving a first magnet (38) for producing a first magnetic field in a region of the first container (10) and in the portion (16) or

- a first magnet (38) or a first recess (36) for receiving a first magnet (38) for producing a first magnetic field in a region of the first container (10) and a second magnet or a second recess for receiving a second magnet for producing a second magnetic field in the portion (16),

- the region, the portion (16) and the first recess (36) or the first magnet (38) and, if present, the second recess or the second magnet being arranged and/or formed in such a way that the magnetic field within the portion (16) has a greater average field strength than the magnetic field within the first container (10).

14. The device as claimed in claim 13, the magnet (38) being a permanent magnet.

15. The device as claimed in claim 13 or 14, the portion (16) being formed as a recess in the first line (14).

16. The device as claimed in one of claims 13 to 15, the portion (16) being formed in such a way that, when a liquid flows in a first direction, a laminar flow can be produced in the portion (16), and when the liquid flows in a second direction, in particular opposite to the first direction, a turbulent flow can be produced.

17. The device as claimed in one of claims 13 to 16, at least one second line (34) branching off from the first line (14).

18. The device as claimed in one of claims 13 to 17, an opening of the second line (34) opening out in the portion (16), the opening being arranged in such a way that liquid flowing through the opening into the portion (16) can cause turbulences in the portion (16) and, as a result, microparticles (18) deposited there can be suspended.

19. The device as claimed in one of claims 13 to 18, the first line (14) having a diameter of from 50 µm to 2 mm, with preference from 100 µm to 500 µm.

20. The device as claimed in one of claims 13 to 19, the portion (16) having a cross-sectional area which is at most three times, preferably at most two times, as large as the cross-sectional area of the first line (14).

21. The device as claimed in one of claims 13 to 20, the portion (16) having a cross-sectional area of at most 2 mm^2, preferably at most 1 mm^2.

22. The device as claimed in one of claims 13 to 21, a second container (12) for the provision of a second liquid (40), a third container for the provision of a further liquid and/or a fourth container for receiving the first (20) and optionally second (40) and/or further liquid being provided in the device.

23. The device as claimed in one of claims 13 to 22, the second line (34) opening out into the second container (12) and optionally provided further lines (30) opening out into the third or fourth

container.

24. The device as claimed in one of claims 13 to 23, a plunger (22, 24) being respectively provided in the first (10), second (12), third and/or fourth container, which plunger is displaceable therein and by means of which the first (20), second (40) or further liquid can be moved.

25. The device as claimed in one of claims 13 to 24, the first (10), second (12), third and/or fourth container in each case being provided in the form of an exchangeable cartridge (48, 50).

26. The device as claimed in one of claims 13 to 25, the first (10), second (12), third and/or fourth container being cylindrically formed.

27. The device as claimed in one of claims 13 to 26, the first (10), second (12), third and/or fourth container having a maximum volume of from 50 µl to 50 ml, with preference from 500 µl to 5 ml.

28. The device as claimed in one of claims 13 to 27, the device being insertable into a unit for sample processing, in particular automated sample processing.

29. The device as claimed in claim 28, the unit having at least one means for displacing the plunger (22, 24).

30. The device as claimed in one of claims 13 to 29, the device being produced from a plastic, in particular polycarbonate, preferably by means of an injection-molding process.